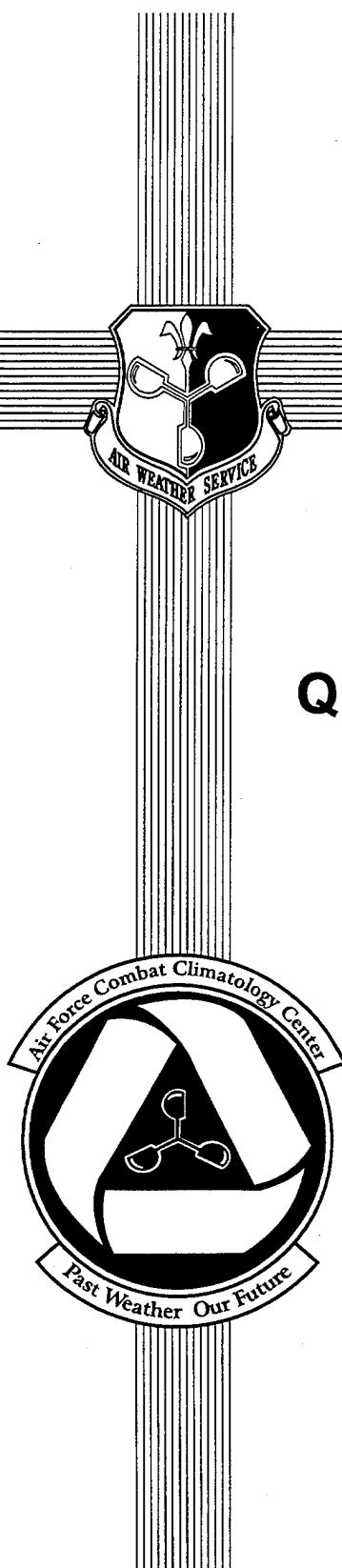# Atmospheric Slant Path Analysis Model (ASPAM) Quick Reference Users Handbook

By
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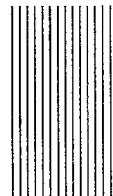TSgt Heidi Tryon

FEBRUARY 1996

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29 February 1996

REPORT DOCUMENTATION PAGE

2. Report Date: February 1996

3. Report Type: Users Handbook

4. Title: Atmospheric Slant Path Analysis Model (ASPAM) Quick Reference Users Handbook

7. Performing Organization Name and Address: Air Force Combat Climatology Center (AFCCC), 859 Buchanan St, Scott AFB IL 62225-5116

8. Performing Organization Report Number: AFCCC/UH—96/002

12. Distribution/Availability Statement: Approved for public release; distribution is unlimited.

13. Abstract: Provides a quick reference guide for reading ASPAM point analysis products. Provides format and definitions for paragraph outputs and examples of output data for each paragraph included in point analysis products.

14. Subject Terms: ATMOSPHERIC SLANT PATH ANALYSIS MODEL, POINT ANALYSIS, PSEUDO-SURFACE OBSERVATION, WIND, TEMPERATURE, ABSOLUTE HUMIDITY, DENSITY, PRESSURE, AEROSOL PARAMETERS, REFRACTIVE INDEX, RADIOSONDE VERTICAL PROFILE, OPTIMUM INTERPOLATION VERTICAL PROFILE, HIGH RESOLUTION ANALYSIS SYSTEM, SPACE ENVIRONMENTAL SUPPORT SYSTEM

15. Number of Pages: 20

17. Security Classification of Report: Unclassified

18. Security Classification of This Page: Unclassified

19. Security Classification of Abstract: Unclassified

20. Limitation of Abstract: UL

Standard Form 298

INTRODUCTION

This users handbook serves as a quick reference guide for reading Atmospheric Slant Path Analysis Model (ASPAM) Point Analysis (PA) products. For additional information, please refer to Chapter 3 of the *Improved Point Analysis Model (IPAM) User's Guide* (AFGWC/TN—91/001). IPAM was renamed ASPAM in 1992.

Point analysis products give a numerical description of weather at a given instant and indicate weather from one point (site) to another in either a vertical or horizontal direction. Vertical PA elevation angles range between 10 and 90 degrees. When slanted, PAs indicate weather in a direction between 001 and 360 (due north).

Two types of PAs exist: Radiosonde Vertical Profile (RAOBVP) and Optimum Interpolation Vertical Profile (OIVP). The RAOBVP uses radiosonde data while the OIVP employs a combination of available surface and upper-air (balloons, radiosonde, rocketsonde, satellite) observations and the High Resolution Analysis System (HIRAS).

The ASPAM output format is based on sequential paragraphs labeled A through K. The content of each paragraph depends on the options selected by the customer, for example, RAOB PAs usually come with Paragraph F.

TABLE OF CONTENTS

CHAPTER 1

POINT ANALYSIS (PA) OUTPUT CONTENT

1.1 General. The following paragraphs serve as a quick reference guide for information contained in PA products. The paragraphs are explained sequentially, A through K, as in the ASPAM output.

1.2 Paragraph A - Point Analysis Site Identification. Paragraph A of the ASPAM product identifies the site or location of the PA. The latitude and longitude are in degrees and hundredths of a degree. A minus (-) sign indicates the Southern and Western Hemispheres. The example below represents 65.28°N, 126.80°W.

Format: sXXX.XX sYYY.YYY

SITE IDENTIFICATION EXAMPLE

A. SITE 65.28 -126.80

1.3 Paragraph B - Date and Time. Paragraph B specifies the time and date of the event for which the PA is provided. The time is in universal coordinated time.

Format: TTTTZ DD MMM YY

DATES/TIME EXAMPLE

B. TIME 1200Z 11 APR 92

NOTE: The customer determines site and time. When the customer requests sanitation, the locations and times are omitted.

1.4 Paragraph C - Cloud Cover. Cloud cover is obtained from the synoptic Real Time Nephanalysis (RTNEPH) closest to the event time. The time and date of RTNEPH data is shown above the cloud grid. The time will be the 3- or 6-hourly (00Z, 03Z, 06Z, 09Z, and so forth) report nearest the PA time. Each grid point shows a cloud description, High (H), Middle (M), and Low (L) cloud layer amounts, and the Total (T) cloud amount in eighths of sky coverage. The grid contains a minimum radius of 75 nm surrounding the location site. The example below represents 4/8s sky coverage of high clouds, 3/8s coverage of middle clouds, 2/8s coverage of low clouds, and a total for all the cloud layers of 6/8s. The total is not necessarily the sum of the three layers, due to possible overlapping of cloud layers. The number of lines in the cloud depiction is shown in the parentheses, for example 0048 indicates 48 lines. The PA point is located in the center of Paragraph C.

CLOUD COVER EXAMPLE

C. CLOUD COVER - (0048)

RTNEPH for 1200Z 01/07/89 USED IN CLOUD DEPICTION

```
    4                    FORMAT:  H
    3      6                      M  T
    2                             L
```

1.5. Paragraph D - Pseudo-Surface Observation (Weather at Site). The output format for the pseudo-observation is as follows:

Format: VSBY vv.vv NM x/8 ct bbb/ttt x/8 ct bbb/ttt x/8 ct bbb/ttt x/8 ct bbb/ttt
TOTAL CLOUD COVERAGE T/8
WIND dddfffGfff PRESENT WEATHER REMARK

Where:

vv.vv	=	surface visibility in nautical miles (to the nearest hundredth)
x/8	=	amount of cloud layer in eighths
ct	=	the cloud type (See table)
bbb	=	base of cloud layer in hundreds of feet/AGL
ttt	=	top of cloud layer in hundreds of feet/AGL
x/8	=	total cloud cover in eighths
ddd	=	direction in whole degrees true (000 indicates calm)
fff	=	speed in knots
Gfff	=	gust speed in knots (when it exists)
RMK	=	Plain language remark on cloud coverage tendency, for example CLD INCRSG, CLD DCRSG , OR CLD SAME. A remark is not always included.

In the example below, visibility is 10.00 nm with 2/8s of stratocumulus. The base of the cloud is at 2,000 feet AGL and the top is at 4,000 feet. There are also 3/8s of altocumulus with a base at 11,000 feet, a top at 14,000 feet and 5/8s of cirrostratus with base at 28,000 feet and top at 35,000 feet. From the observation point, 7/8s of the sky is covered. The wind direction is from 240 degrees, the speed is 20 knots with gusts to 26 knots. There has been no change in cloud coverage over the past 3 hours.

Example of PA paragraph D output

D. WEATHER AT SITE
VSBY 10.00 NM 2/8 SC 020/040 3/8 AC 110/140 5/8 CS 280/350 0/8 ** ***/***
TOTAL CLOUD COVERAGE 7/8
WIND 240020G026 CLD SAME

NOTE: An asterisk (*) indicates no data, an entry of UN indicates missing data.

CLOUD TYPES FOR ASPAM PARAGRAPH D OUTPUT	
Abbreviation	Cloud Type
CB	Cumulonimbus
ST	Stratus
SC	Stratocumulus
CU	Cumulus
AS	Altostratus
NS	Nimbostratus
AC	Altocumulus
CS	Cirrostratus
CC	Cirrocumulus
CI	Cirrus
UN	Unknown

1.6 PARAGRAPH E - PRECIPITABLE WATER. Paragraph E provides precipitable water amounts expressed in centimeters for specified layers at the PA site. The calculated value for precipitable water is written as follows:

Format: X.XXEstu

where:

X.XX = precipitable water amounts expressed in centimeters (cm).

E = exponential value to the base 10.

s = a sign for (+) or (-)

t = the tens value of the exponent

u = the unit value of the exponent

The following example indicates .471 cm of precipitable water (possible precipitation) between the surface and 1,000 feet above ground level (AGL). M represents a factor of 1000 (Roman numerals).

EXAMPLE OF PRECIPITABLE WATER

E. PRECIPITABLE WATER (CM) -
SFC-1M FT 4.71E-01   10M - 12M FT 2.54E-01   40M - 45M 5.28E-04
1M- 2M FT 1.58E-01   12M - 14M FT 1.03E-01   45M - 50M 9.83E-05
2M- 3M FT 1.34E-02   14M - 16M FT 1.54E-01   50M - 60M 8.75E-04

1.7 PARAGRAPH F - WINDS, TEMPERATURE, ABSOLUTE HUMIDITY, DENSITY, PRESSURE. Paragraph F provides analytic data at a specified height AGL/mean sea level (MSL) at the ASPAM point. The format and parameters are as follows:

Format: hhhM ddd sss sTTT g.gggEstu d.dddEstu ppp.pp

where:

hhhM = height of the level

Note: The customer selects height in thousands of feet indicated by M or hundreds of meters indicated by H.

ddd = wind direction in degrees true

sss = wind speed in meters per second

sTTT = temperature in degrees Celsius

Note: A negative (-) symbol (s) indicates the temperature (s) is below freezing.

g.ggg = absolute humidity in grams per cubic meter

E = Exponential value to the base 10

s = a sign for (+) or (-)

t = the tens value of the exponent

u = the unit value of the exponent

d.ddd = density value in grams per cubic centimeter

E = exponential value to the base 10

s = a sign for (+) or (-)

t = the tens value of the exponent

u = the unit value of the exponent

ppp.pp = pressure in millibars for this level (not corrected for Sea Level)

Note: An asterisk (*) indicates data is not available

In the following example, surface (SFC) winds are from 179 degrees at 3 meters per second (approximately 6 kts), the temperature is 15 degrees Celsius, the absolute humidity is 10.23 grams per cubic meter, the density is .001186 grams per cubic centimeter and the pressure is 987.00 millibars. Paragraph F is usually chosen with a RAOB PA.

EXAMPLE OF PA PARAGRAPH F

F. WINDS, TEMPERATURE, ABS HUMIDITY, DENSITY, PRESSURE

HEIGHT F AGL	DIR (DEG)	SPEED (M/SEC)	TEMP (DEG C)	ABS HUM (GM/M3)	DEN (GM/CM3)	PRES (MB)
SFC	179.	3.	15.	1.023E+01	1.186E-03	987.00
1M	196.	6.	21.	1.099E+01	1.119E-03	952.00
2M	216.	10.	21.	1.153E+01	1.081E-03	917.00
3M	226.	10.	18.	9.689E+00	1.054E-03	887.00

1.8 PARAGRAPH G, REMARKS: SELF-EXPLANATORY.

EXAMPLE OF PA PARAGRAPH G.

G. REMARKS - (0038) PA SURFACE ELEVATION 0 METERS
DISTANCE AND BEARING TO NEAREST RAOB -- 15.0 NM AT 178.0 DEG
RAOB STATION NUMBER -- 725530 (WMO BLOCK STATION NUMBER)
RAOB SITE ELEVATION -- 1312 FT
EVENT SITE ELEVATION -- 675 FT (USER SUPPLIED)
SOME ANALYSIS FIELDS DATA USED TO FILL IN 15 STANDARD PRESSURE LEVELS
NO HIRAS ANALYSIS USED ABOVE HIGHEST RAOB LEVEL.
RAOB BASE TIME -- 12 Oct 92 1200Z

NOTE: RAOB information is only available with RAOB PAs.

Example of PA Paragraph G.

SURFACE OBSERVATIONS	1	2
BLOCK/STATION NUMBER	72549	72553
CALL LETTERS	FOD	OVN
ZULU TIME	1200Z	1200Z
BEARING (DEG)	55	178
DISTANCE (NM)	99	15
WIND DIRECTION (DEG)	130	160
WIND SPEED (KTS)	9	9
SEA LEVEL PRESSURE (MB)	1010.2	1010.2
3-HRLY PRES CHANGE (MB)	+ 0.2	
ALTIMETER SETTING (IN)	29.86	
VISIBILITY (NM)	10.3	
6-HR PRECIPITATION (IN)		.5
TEMPERATURE (DEG C)	18	19
DEW POINT (DEG C)	7	11
PRESENT WEATHER		
CLOUDS:		
LOW, MID, HIGH TYPES	MIS, MIS, MIS	0, 0, CS8
REPORT CLOUD LAYERS (COVER, TYPE, X100 FT)		
TOTAL COVERAGE	6/8	
CEILING (X 100 FT)		

MF =116. F=102. A= 29.

MOISTURE QUALITY INDEX	= 4.81
TEMPERATURE QUALITY INDEX	= 3.44
SLANT PATH AZIMUTH	= 135.0
SLANT PATH ELEVATION	= 45.0

Space Environmental Support System (SESS) data is always included in Paragraph G. ASPAM uses SESS variables to determine the temperature structure of the upper atmosphere to 400,000 feet MSL. Variables include the 90-day mean flux (MF), the daily flux (F), and the planetary geomagnetic index (A). The model uses default values of MF = 120, F = 120, and A = 10 if the data is missing from ASPAM input tables. The 50th Weather Squadron, the Air Force's Space Forecast Center at Falcon AFB, Colorado, collects SESS data. The values are MF = 116, F = 102, A = 29 in the above example. The moisture quality index is based on specific humidity errors. The temperature quality index is based on the temperature errors. When either quality index is less than 1.5, the profile is questionable.

Radiosonde data is the basis of RAOBVP PAs. The remarks section will indicate the RAOB used, and the bearing and distance from the requested site. OIVP PAs employ a combination of available surface observations, upper air and a high resolution analysis system (HIRAS). A data source table may be requested when the PA is OIVP.

Possible data sources

PBL - Pibal, upper-air balloons
AIR - Aircraft
SFC - Surface observations
GOE - GOES satellite winds

RAB - RAOB, Radiosonde
SAT - Satellite
ROC - ROCOB, Rocketsonde

EXAMPLE OF ASPAM PARAGRAPH G DATA SOURCE OUTPUT

DATA SOURCE WEIGHT TABLE:

LEVEL	WIND	TEMP	ABS HUM	HGT
FT/AGL	SRC/WGT/CORR	SRC/WGT/CORR	SRC/WGT/CORR	SRC/WGT/CORR
SFC	SFC/0.05/0.95	SFC/0.07/0.91	SFC/0.10/0.97	SFC/0.06/0.95
0.750	PBL/0.34/0.76	SFC/0.22/0.82	SFC/0.44/0.51	SFC/0.35/0.47
1.008	PBL/0.43/0.82	RAB/0.28/0.64	RAB/0.35/0.74	RAB/0.22/0.14
1.764	SAT/0.27/0.64	RAB/0.33/0.93	SAT/0.50/0.34	RAB/0.54/0.90
....	....	....	....	....
....	....	....	....	....
....	....	....	....	....
100.350	SAT/0.32/0.42	- /0.00/0.00	- /0.00/0.00	SAT/0.32/0.81

Height can be in feet or meters / AGL or MSL (as requested). Feet are in 1,000-foot increments and meters are in 1,000-meter increments.

SRC = Source of data. A dash (-) in this column indicates no data available, so "first guess" (analysis) data is used to fill in.

WGT = the weighting factor in percent that the ASPAM program assigns each source of data at that particular level. Values range from a low of 0 to a high of 1.0.

CORR = correlation coefficient calculated by ASPAM program. Values range from a low of 0 to a high of 1.

1.9 PARAGRAPH H - AEROSOL PARAMETERS AND VERTICAL PROFILE INFORMATION

Format: VERTICAL PROFILE INFORMATION LLHCCSVvvM$_3$QQv$_a$v$_a$H$_a$C$_a$C$_a$

where:

LL = number of levels

H = primary boundary layer aerosol parameter
1, 2, or 5 indicates land (1 is rural, 2 is urban, 5 is tropospheric)
3 or 4 indicates Maritime (3 is open ocean, 4 is coastal)
6 indicates fog

CC = air parcel type, this reflects the amount of time since the airmass was over dry land, only included if H is 3 (the airmass is over open ocean)

S = seasonal dependence
1 indicates spring/summer, March - August or latitude is less than 20 degrees
2 indicates fall/winter September - February or latitude is greater than 70 degrees

V = profile and extinction type for stratospheric aerosols
1 = background stratospheric aerosol (small amount)
2 = moderate concentration of volcanic aerosol (aged profile)
3 = high concentration of volcanic aerosol (fresh profile)
4 = high concentration of volcanic aerosol (aged profile)
5 = moderate concentration of volcanic aerosol (fresh profile)
9 = missing

vv = surface visibility range, a function of the atmospheric extinction coefficient, the albedo, visual angle, and the observer's threshold contrast at the moment of observation

M_3 = ozone profile. Represents a climatological component profile of ozone.
1 indicates latitude is less than 20 degrees
2 indicates latitude is between 20 degrees - 70 degrees (summer)
3 indicates latitude is between 20 degrees - 70 degrees (winter)
4 indicates latitude is greater than 70 degrees (summer)
5 indicates latitude is greater than 70 degrees (winter)
6 indicates profile is US standard

QQ = boundary layer parameter quality index

V_aV_a = alternate surface visibility range

H = alternate boundary layer aerosol parameter.
Same values as H (primary boundary layer)

C_aC_a = alternate air parcel type (only included if H = 3)

The rest of the paragraph has the following format:

$$hhhhh\ pppp\ sTTTT\ qqqq\ AHAZ\ sT_aT_aT_a\ q_aq_aq_aq_a\ AHAZ_a\ sXXXXYYYYY\ Z.ZZZ$$

where:

hhhhh = height in hundredths of kilometers MSL. A negative value indicates the site elevation is below sea level.
pppp = pressure to tenths of a millibar

sTTTT = temperature in Celsius e.g. 125 = 12.5°C. Negative if minus (-) sign is included.

qqqq = water vapor density in g/m^3

AHAZ = *** Not used

$sT_aT_aT_a$ = alternate temperature in Celsius, negative when a minus (-) sign is included

$q_aq_aq_aq_a$ = alternate water vapor density in hundredths of a gram per cubic meter

AHAZ = *** Not used

sXXXX= latitude in hundredths of a degree, negative (-) indicates south (e.g., 4162 = 41.62)

YYYYY = longitude in hundredths of a degree

Note: The frame of reference for longitude is 0 degrees, the prime meridian. Values 180 degrees and less are east, for example, 09000 is 90° E. Values greater than 180 are west, for example, 26397 is 96.03° W (360 - 263.97 = 96.03° W).

Z.ZZZ = ozone day-night ratio in parts per million.

EXAMPLE OF ASPAM PARAGRAPH H

H. AEROSOL PARAMETERS
VERTICAL PROFILE INFORMATION 351 11193 9 62

20	9870	153	1023	164	917	416226397	0.025
25	9813	152	992	161	912	416226397	0.025
50	9523	213	1093	222	1005	416226397	0.027
75	9242	206	1183	214	1110	416226397	0.025
100	8984	184	1020	195	919	416226397	0.025
125	8730	179	920	191	794	416226397	0.027

The example LL is 35 indicating 35 levels. The primary boundary layer aerosol type "1" indicates the air mass is over land, and rural. The air parcel type (CC) is omitted. The season "1" is spring/summer with background stratospheric aerosol content "1" which indicates normal. The surface visibility range is 19. The composite ozone profile latitude "3" is for between 20° and 70°, winter. The boundary layer quality index is 9. The alternate surface visibility range is 6. The alternate boundary layer aerosol parameter is "2" which indicates a land, urban air mass.

The third line of the above example shows a height of 0.2 km MSL, the pressure is 987.0 mb, the temperature is 15.3° C, the water vapor density is 10.23 gm/m3. There is an alternate profile temperature of 16.4° C and an alternate water vapor density of 9.17 gm/m³· The location is 41.62° N and 96.03°W (360 - 263.97 = 96.03).

EXAMPLE OF ASPAM PARAGRAPH H WITH SLANTPATH

H. AEROSOL PARAMETERS
VERTICAL PROFILE INFORMATION352 22 63 7 42

20	9967	-16	403	-10	389	4825	1637	0.025
25	9905	-15	400	-8	387	4825	1637	0.025
50	9601	-8	397	-2	385	4825	1637	0.027
75	9306	-4	403	3	391	4825	1638	0.029
100	9021	-9	369	-2	358	4826	1638	0.031
125	8744	-15	332	-8	320	4826	1638	0.033

A slant path profile indicates different subpoints along the path in the latitude and longitude (XXXX, YYYYY).

1.10 PARAGRAPH I - WINDS, TEMPERATURE, ABSOLUTE HUMIDITY, DENSITY, PRESSURE.
This paragraph is used with OIVP PAs. The customer has the option of moving the information to paragraph F. The format is the same as paragraph F.

EXAMPLE OF PA PARAGRAPH I OUTPUT

I. WINDS, TEMPERATURE, ABS HUMIDITY, DENSITY, PRESSURE -						
HEIGHT	DIR	SPEED	TEMP	ABS HUM	DEN	PRES
F AGL	(DEG)	(M/SEC)	(DEG C)	(GM/M3)	(GM/CM3)	(MB)
SFC	179.	3.	15.	1.023E+01	1.186E-03	987.00
1M	196.	6.	21.	1.099E+01	1.119E-03	952.00
2M	216.	10.	21.	1.153E+01	1.081E-03	917.00
3M	226.	10.	18.	9.689E+00	1.054E-03	887.00

1.11 PARAGRAPH J - 24-HOUR SURFACE WEATHER HISTORY. This paragraph provides a 24-hour coded weather history for the event site.

Format: $YYJJJhhmmbbb_xcv_xth_xbbb_xcv_xth_xbbb_xcv_xth_xbbb_xcv_xth_xtcvvpto\ pppp\ sTT\ sDDddsssaaa$

Note: subscript "$_x$" is not printed. It is used to indicate separate layers. The group "$bbb_xcv_xth_x$" is repeated four times. An entry of 999 means the data is missing.

Where:

YY	= year, (e.g. 88 is 1988)
JJJ	= Julian day (e.g. 139 is 18 May)
hh	= hour UTC (e.g. 12 is 12Z)
mm	= minutes

Note: Information starts at the time of the PA. The next line is valid at the nearest previous 3-hourly observation (00, 03, 06, 09, 12, 15, 18 21Z). Each subsequent line is valid 3 hours early, eight lines describe a 24-hour history.

bbb	= cloud base in hundreds of meters AGL.
cv_x	= cloud coverage, to the nearest ten percent.
th_x	= cloud layer thickness in hundreds of meters.
tc	= total cloud cover in percent
vv	= visibility in kilometers

pt = precipitation type

R	= rain or drizzle		SW	= snow shower
S	= snow		A	= hail
RS	= rain & snow		IP	= ice pellets
ZR	= freezing rain		IC	= ice crystals
RW	= rain shower			

O = obscuration to visibility

K	= smoke		D	= dust/sand
F	= fog		BS	= blowing snow
H	= haze			
I	= fog depositing rime ice			

pppp	= pressure in tenths of millibars (e.g. 9870 is 987.0 MB)
sTT	= temperature in degrees Celsius (If negative, a minus (-) is included)
sDD	= Dewpoint in degrees Celsius
ddsss	= wind direction in tens of degrees (e.g., 18 = 180°) and speed in meters/sec.
aaa	= alternate wind speed in meters/sec

Following the surface weather history are three values:

Format: $T_hT_h\ T_lT_l\ SSS$ Example: 29 15 0

T_hT_h	= maximum 24-hour temperature in degrees Celsius, for example, 29 = 29°C
T_lT_l	= minimum 24-hour temperature in degrees Celsius
SSS	= snow depth in inches

EXAMPLE OF ASPAM PARAGRAPH J

J.SURFACE WEATHER HISTORY
24 HOUR SURFACE WEATHER HISTORY

```
8813911150000000000000000000000000000019000 9870  15  918003004
8813909000000000000000000000000000000019000 9870  15  918003004
8813906000780309000000000000000000002519000 9875  22  1518008010
8813903000780309000000000000000000002519000 9875  23  1518008010
8813900000780309000000000000000000002519000 9875  24  1518008010
8813821000780309000000000000000000002519000 9875  22  1518008010
8813815000780309000000000000000000002519000 9875  20  1518008010
8813812000330309000000000000000000002519000 9875  18  1518008010
        29   15   0
```

All lines indicate 1988. The third line indicates 18 May (Julian day 139) at 0600Z. The base of the first cloud layer is at 7,800 meters AGL, the coverage is 30 percent, and the thickness is 900 meters. There are no other clouds present (filled with zeros). The total sky coverage is 25 percent. The visibility is 19 km, precipitation and obscurations to visibility were not occuring. The pressure was 987.5 mb, the temperature was 22° C and the dew point was 15° Celsius. The wind was from 180 degrees at 8 meters per second with an alternate wind speed of 10 meters per second.

The last line indicates a maximum 24-hour temperature of 29° C. The minimum 24-hour temperature is 15° C. There is no snow.

EXAMPLE OF ASPAM PARAGRAPH J

J.SURFACE WEATHER HISTORY
24 HOUR SURFACE WEATHER HISTORY

```
9310511115016060309010090000000000000009920 R010056  3  236004005
9310509000161003000000000000000000000009912 R010048  5  535008010
9310506000181063000000000000000000000991299910049  6  435008010
        6   4   1
```

In this example, there is precipitation, and the type is rain or drizzle. The pressure on line 3 is in 5 digits for 1005.6 mb.

1.12 PARAGRAPH K - REFRACTIVE INDEX. Paragraph K provides profiles of radio and optical indices of refraction. The data is calculated from previously constructed vertical profiles. The data is presented in heights in feet up to 100,000 feet, in intervals from 500 to 2,500 feet. The height and interval are determined by the user.

Format: pppp.p hhhhhh ddd sss TT.TT rrr RRR.R o.oooooo DDD.DDDD AAAAAA

Where:

pppp.p	= pressure of the level in millibars
hhhhhh	= height of the level, in feet/AGL
ddd	= wind direction in degrees
sss	= wind speed in meters per second
TT.TT	= temperature in degrees Celsius

rrr	= relative humidity (converted from absolute humidity)
RRR.R	= the radio index (computed using a formula) ranges from Gamma rays to very high frequency.
o.oooooo	= the optical index (computed using a formula) ranges from violet to red.
DDD.DDDD	= the difference between the radio indices at the level and the next level.
AAAAAA	= the refractive condition (determined by the size of delta) range from subrefractive to normal to super refractive to trapping.

EXAMPLE OF ASPAM PARAGRAPH K

K. REFRACTIVE INDEX PROFILE

PRESS MB	HGT FT	WD DG	WS M/S	TEMP DG C	RH PRCT	RADIO INDEX	OPTICAL INDEX	REFRC DELTA	COND
1020.0	0	320	2	4.24	90				
983.0	1000	356	2	10.11	25	305.2	1.000305	-27.2009	SUPER
947.7	2000	70	1	9.42	14	278.0	1.000278	-10.7483	NORMAL
913.4	3000	200	1	8.16	10	267.3	1.000267	-7.3337	NORMAL
879.7	4000	230	4	6.22	10	259.9	1.000254	-2.8748	NORMAL

The second line of the example indicates a pressure of 983.0 MB at 1000 feet. The wind has a direction of 356 and a speed of 2 meters per second. The temperature is 10.11 C, the relative humidity is 25 percent.

Gl

D. WEATHER AT SITE

VSBY 03.24 NM 0/8 ** ***/***, 0/8 ** ***/***, 2/8 ST 024/034, 8/8 ST 058/068
TOTAL CLOUD COVERAGE 8/8
WIND 305015G*** LGT CON SNOW

E. PRECIPITABLE WATER (CM) -

SFC - 1M FT 9.64E-01	10M - 12M FT 3.81E-01	40M - 45M FT 9.69E-04
1M - 2M FT 8.74E-01	12M - 14M FT 2.53E-01	45M - 50M FT 7.80E-04
2M - 3M FT 7.79E-01	14M - 16M FT 1.63E-01	50M - 60M FT 1.12E-03
3M - 4M FT 6.93E-01	16M - 18M FT 1.05E-01	60M - 70M FT 7.03E-04
4M - 5M FT 6.07E-01	18M - 20M FT 6.76E-02	70M - 80M FT 4.38E-04
5M - 6M FT 5.20E-01	20M - 25M FT 8.43E-02	80M - 90M FT 2.68E-04
6M - 7M FT 4.30E-01	25M - 30M FT 1.70E-02	90M - 100M FT 1.71E-04
7M - 8M FT 3.50E-01	30M - 35M FT 1.52E-03	
8M - 10M FT 5.33E-01	35M - 40M FT 1.21E-03	

F. WINDS, TEMPERATURE, ABS HUMIDITY, DENSITY, PRESSURE -

G. REMARKS - (0067) PA SURFACE ELEVATION IS 138 METERS

SURFACE OBSERVATIONS	1	2	3	4
BLOCK/STATION NUMBER	72433	72433	72445	72434
CALL LETTERS	BLV	MVN	VIH	STL
ZULU TIME	1200Z	1200Z	1200Z	1200Z
BEARING (DEG)	0	106	255	297
DISTANCE (NM)	1	48	94	27
WIND DIRECTION (DEG)	320	300	300	320
WIND SPEED (KTS)	25	9	16	25
SEA LEVEL PRESSURE (MB)	1008.5		1013.3	1009.5
3-HRLY PRES CHANGE (MB)	+ 3.9			+ 4.7
ALTIMETER SETTING (IN)	29.77	29.71	29.89	29.80
VISIBILITY (NM)	6.1	8.7	13.0	4.9
6-HR PRECIPITATION (IN)				TRACE
TEMPERATURE (DEG C)	-1	-1	-3	-2
DEWPOINT (DEG C)	-5	-6	-6	-5
PRESENT WEATHER	LGT CON SNOW			LGT CON SNOW
PAST WEATHER				SNOW
CLOUDS:				
LOW, MID, HIGH TYPES	SF7,AS2,MIS	MIS,MIS,MIS	SC5,MIS,MIS	SC5,AS2,MIS
REPORT CLOUD LAYERS				
(COVER,TYPE,X100 FT)				
TOTAL COVERAGE	8/8	8/8	8/8	8/8
CEILING (X100 FT)	M025	M016	E015	050

MF= 99.   F=119.   A= 12.

DATA SOURCE WEIGHT TABLE:

LEVEL MT/MSL	WIND SRC/ WGT/CORR	TEMP SRC/ WGT/CORR	ABS HUM SRC/ WGT/CORR	HGT SRC/ WGT/CORR
SFC	PBL/0.28/0.88	RAB/0.23/0.88	RAB/0.27/0.89	RAB/0.27/0.89
0.239	PBL/0.26/0.84	RAB/0.20/0.88	RAB/0.25/0.89	RAB/0.23/0.89
0.486	PBL/0.22/0.84	RAB/0.13/0.88	RAB/0.19/0.8	RAB/0.19/0.89
0.738	PBL/0.20/0.89	SFC/0.20/0.6	8RAB/0.15/0.88	RABB/0.23/0.89
0.993	PBL/0.19/0.84	RAB/0.14/0.89	SFC/0.11/0.72	RAB/0.17/0.89
1.247	PBL/0.19/0.83	SFC/0.10/0.68	SFC/0.11/0.71	RAB/0.12/0.88
1.496	PBL/0.22/0.89	RAB/0.10/0.89	RAB/0.09/0.89	RAB/0.10/0.73
1.744	PBL/0.23/0.88	RAB/0.12/0.90	RAB/0.11/0.90	RAB/0.11/0.87
1.993	PBL/0.23/0.85	RAB/0.12/0.90	RAB/0.13/0.90	RAB/0.12/0.88
2.244	PBL/0.21/0.82	RAB/0.12/0.87	RAB/0.14/0.87	RAB/0.12/0.88
2.496	PBL/0.15/0.90	RAB/0.15/0.89	RAB/0.10/0.89	RAB/0.15/0.89
2.996	PBL/0.13/0.88	RAB/0.18/0.89	RAB/0.12/0.89	RAB/0.19/0.90
3.489	PBL/0.11/0.82	RAB/0.17/0.86	RAB/0.12/0.90	RAB/0.18/0.86
3.987	PBL/0.12/0.89	RAB/0.17/0.68	RAB/0.13/0.89	RAB/0.17/0.88
4.490	PBL/0.08/0.89	RAB/0.13/0.89	RAB/0.12/0.90	RAB/0.15/0.89
4.996	AIR/0.09/0.84	RAB/0.13/0.69	RAB/0.12/0.90	RAB/0.13/0.89
5.988	PBL/0.08/0.78	RAB/0.13/0.89	RAB/0.13/0.89	RAB/0.18/0.89
6.995	PBL/0.09/0.88	RAB/0.10/0.90	RAB/0.12/0.90	RAB/0.16/0.90
7.840	PBL/0.13/0.74	RAB/0.18/0.89	RAB/0.12/0.89	RAB/0.19/0.89
7.987	PBL/0.11/0.74	RAB/0.15/0.89	RAB/0.12/0.9	RAB/0.16/0.89
8.996	AIR/0.07/0.89	SAT/0.42/0.93	- /0.00/0.0	RAB/0.12/0.92
9.999	PBL/0.08/0.77	AIR/0.12/0.90	- /0.00/0.00	RAB/0.16/0.90
12.497	PBL/0.12/0.88	RAB/0.10/0.88	- /0.00/0.00	RAB/0.18/0.83
14.994	PBL/0.10/0.88	RAB/0.10/0.93	- /0.00/0.00	RAB/0.19/0.93
17.497	PBL/0.18/0.91	RAB/0.12/0.83	- /0.00/0.00	RAB/0.18/0.92
20.002	PBL/0.17/0.92	SAT/0.09/0.93	- /0.00/0.00	RAB/0.12/0.92
22.513	PBL/0.16/0.92	RAB/0.11/0.90	- /0.00/0.00	RAB/0.19/0.90
25.033	PBL/0.16/0.78	SAT/0.08/0.83	- /0.00/0.00	RAB/0.21/0.83
27.569	PBL/0.29/0.92	RAB/0.21/0.90	- /0.00/0.00	RAB/0.33/0.78
29.957	PBL/0.48/0.68	SAT/0.13/0.86	- /0.00/0.00	SAT/0.13/0.89

MOISTURE QUALITY INDEX =   4.85
TEMPERATURE QUALITY INDEX=   4.10

SLANT PATH AZIMUTH   = 45.0
SLANT PATH ELEVATION ANGLE = 4.5

H. AEROSOL PARAMETERS

36

VERTICAL PROFILE INFORMATION351 22143 9121

14	9917	-15	367	-5	350	385527015	0.030
25	9763	-23	354	-13	340	385627016	0.030
50	9456	-39	331	-29	320	385827019	0.032
75	9161	-56	308	-47	300	386027021	0.034
100	8876	-73	280	-65	280	386227024	0.035
125	8598	-90	254	-82	254	386427026	0.037
150	8322	-107	223	-99	223	386627029	0.039
175	8053	-122	199	-114	197	386827031	0.041
200	7792	-135	169	-127	165	387027034	0.042
225	7539	-149	147	-141	142	387227036	0.044
250	7295	-163	122	-154	118	387427039	0.045
300	6822	-189	91	-181	87	387727044	0.046
350	6370	-222	69	-213	67	388127048	0.047
400	5948	-257	50	-248	48	388527053	0.048
450	5551	-288	35	-279	34	388827058	0.050
500	5177	-320	24	-311	23	389227063	0.051
600	4481	-379	12	-369	11	389927072	0.054
700	3870	-439	6	-430	5	390627081	0.059
800	3326	-481	3	-471	3	391327090	0.103
900	2859	-490	0	-482	0	392027099	0.204
1000	2459	-459	0	-451	0	392627107	0.354
1250	1691	-464	0	-455	0	394227128	0.915
1500	1156	-510	0	-500	0	395727149	1.677
1750	786	-532	0	-522	0	397227169	2.563
2000	533	-556	0	-546	0	398627188	3.494
2250	360	-561	0	-549	0	400027206	4.392
2500	244	-559	0	-546	0	401327224	5.180
2750	166	-566	0	-549	0	402627242	5.776
3000	112	-591	0	-579	0	403827259	6.326
3500	59	-431	0	-412	0	406227293	7.122
4000	41	-216	0	-188	0	408527325	6.941
4500	16	-86	0	-45	0	410727356	4.863
5000	8	-132	0	-89	0	412827385	2.970
7500	1	-549	0	-480	0	422127523	2.342

I. WINDS, TEMPERATURE, ABS HUMIDITY, DENSITY, PRESSURE -

J. SURFACE WEATHER HISTORY

24 HOUR SURFACE WEATHER HISTORY

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9335912000090303019100300000000000009906 S0  9917   -1  -431008010
9335909000160803000000000000000000007511 S0  9859    7   432009011
933590600005030301310030000000000000990900F 9833    3   028006007
9335903000040303009102202608180000009903 S0  9871    1  -326005006
9335900000090303013100300000000000009906 S0   9909   -1  -625004005
9335821000100303031100900000000000009911000  9952   -1  -726005006
9335818000100303046100900000000000009911000  9994   -2  -826005006
93358150000703030130303025100900000009906  S010009   -2  -628004005
9335812000131003000000000000000000009906  S010024   -2  -431004005
    7 -2 2
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K. REFRACTIVE INDEX

PRESS MB	HGT FT	WD DG	WS M/S	TEMP DG	RH PRCT	RADIO INDEX	OPTICAL INDEX	DELTA	REFRAC COND
991.7	424.	305.	7.5	271.66	83.9				
972.4	924.	305.	8.7	270.66	87.1	303.9	1.000303	-10.5757	NORMAL
953.7	1424.	306.	9.9	269.70	89.2	298.6	1.000299	-10.3315	NORMAL
935.3	1924.	307.	11.2	268.70	91.6	293.4	1.000293	-10.0845	NORMAL
917.4	2424.	308.	12.4	267.68	94.2	288.4	1.000288	-10.0918	NORMAL
899.8	2924.	310.	12.9	266.61	95.9	283.3	1.000283	-10.0977	NORMAL
882.7	3424.	311.	13.3	265.56	97.6	278.3	1.000278	-9.8911	NORMAL
865.7	3924.	311.	13.9	264.52	99.9	273.3	1.000273	-9.9629	NORMAL
848.9	4424.	311.	14.4	263.48	99.9	268.3	1.000268	-10.1396	NORMAL
832.2	4924.	311.	15.0	262.41	99.9	263.3	1.000263	-10.0952	NORMAL
815.7	5424.	311.	15.3	261.53	99.9	258.2	1.000257	-10.0754	NORMAL
799.4	5924.	312.	15.7	260.68	98.1	253.2	1.000253	-10.2206	NORMAL
783.5	6424.	312.	16.0	259.89	94.8	248.1	1.000248	-10.0128	NORMAL
768.0	6924.	313.	16.3	259.04	92.6	243.1	1.000242	-9.5830	NORMAL
752.7	7424.	313.	16.5	258.18	90.6	238.3	1.000237	-9.5142	NORMAL
737.7	7924.	313.	16.2	257.36	86.1	233.5	1.000233	-9.3594	NORMAL
723.0	8424.	313.	16.0	256.54	82.9	228.8	1.000228	-8.9391	NORMAL
708.4	8924.	314.	16.1	255.73	80.9	224.4	1.000224	-8.6542	NORMAL
694.1	9424.	314.	16.1	254.91	78.9	220.0	1.000219	-8.4240	NORMAL
680.0	9924.	314.	16.2	254.06	77.3	215.8	1.000216	-8.0346	NORMAL
666.1	10424.	314.	16.4	253.07	77.4	211.8	1.000212	-7.7377	NORMAL
652.3	10924.	314.	16.5	252.07	77.5	207.9	1.000208	-7.6585	NORMAL
638.6	11424.	314.	16.7	251.05	77.8	204.1	1.000204	-7.4963	NORMAL
625.5	11924.	313.	17.0	250.00	76.9	200.4	1.000200	-7.2922	NORMAL
612.5	12424.	313.	17.3	248.94	76.1	196.7	1.000196	-7.1381	NORMAL
599.8	12924.	313.	17.7	247.87	75.3	193.1	1.000193	-7.0471	NORMAL
587.3	13424.	314.	17.5	246.88	74.0	189.6	1.000189	-6.9756	NORMAL